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Independent Learning of Grade 12 Learners in Mathematics 11 Under the Blended Learning Modality

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Abstract:- This study aimed to describe and analyze the independent learning strategies of Grade 12 learners in Mathematics 11 under a blended learning modality at Partida National High School. Employing a descriptive-correlational research method, data were collected from 90 Grade 12 students through a structured survey to explore their independent learning strategies and assess relationships between learner profiles, grades, and independent learning outcomes. The findings revealed that a significant portion of participants belonged to the General Academic Strand and utilized a modular learning approach alongside face-to-face instruction. Most respondents achieved very satisfactory grades in Mathematics, indicating effective engagement with independent learning strategies. The results suggest that these strategies are crucial for enhancing academic performance. Recommendations for educators include focusing on individualized learning strategies and encouraging self-directed study through written activities and performance tasks. Further research is needed to explore additional factors influencing independent learning strategies and academic success.

Keywords:- *Blended Learning; Mathematics; Independent Learning; Strategies*

I. INTRODUCTION

The importance of learning and education has always been emphasized, with various educational institutions promoting independent and dynamic learning through their programs. However, the COVID-19 pandemic has disrupted traditional learning and forced educational institutions to adopt blended learning as a safe and effective modality for delivering education to every home. The Department of Education, as stated in the DepEd Order No.12, series of 2020 has developed the Basic Education Learning Continuity Plan (BE-LCP) based on principles such as protecting the health and safety of students and teachers, ensuring continuity of learning, facilitating the safe return of faculty and students to schools, and addressing equity considerations.

According to Sawchuk and Sparks (2020), many studies have used data from millions of students who took computer-adaptive tests such as Use the Northwest Assessment Association's MAP growth test and Illuminate Education's FastBridge assessments to estimate student learning growth throughout school closures this past spring 2020 compared to previous years and forecast how much this growth rate is expected to slow in 2020-2021. On average, students would lose more ground in Mathematics than in reading. Three studies based on Northwest Evaluation Association (NWEA) data predicted that in 2020-2021, students could learn half a year to a full year less Mathematics than in a typical year. A study based on data from the FastBridge test showed smaller but still worrisome learning losses at all grade levels: two and a half to four and a half months of lost learning compared to one to two months for reading. These studies were related to the spring of 2020, when schools were abruptly closed due to statewide emergency orders and many districts rushed to establish distance learning services and lesson plans.

Based on studies, distance learning students were like college students with little formal instruction. That was not the same picture as the School Year 2020-2021 when districts reopened with formal lessons. However, classes changed from in-person to virtual classes on a day-to-day and week-to-week basis. Similarly, Curriculum Associates, a company that provides testing, curriculum, and professional development services, compared the test scores of a non-representative sample of college students. It also found that students were losing more ground in Mathematics than in reading, and that 5 to 9 percentage points more students were lagging two or more grades behind in Mathematics. Additionally, a national survey by the Understanding Coronavirus in America found that while parents of K-12 students generally feel that instruction has not returned to pre-COVID-19 quality, they were significantly more concerned about Mathematics than reading, and particularly when their students were attending virtual or hybrid classes. Mathematics may be more sensitive to pandemic-related school suspensions for several reasons, experts say that unlike reading, Mathematics is almost always learned formally in school. Thus, parental support can be even more crucial to student progress. Broader stress and trauma related to the pandemic may exacerbate existing mathematics anxiety in some students, and mathematics anxiety may exacerbate other students'

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stress during class and may pose a greater challenge for teachers to engage in effective mathematics teaching practices through remote platforms.

The study of independent and blended learning was worthwhile in the context of the COVID-19 pandemic and the new normal in education as it had disrupted traditional learning and forced educational institutions to explore new ways of learning and teaching, such as this new way of learning creates both challenges and opportunities for students and teachers. Several studies have shown that after schools closed and switched to distance learning, students suffered significant learning losses, particularly in Mathematics. Addressing these learning losses and ensuring continuity of learning for all students is critical.

A. Theoretical and Conceptual Framework

This study was based on the Kumon Learning Theory, which was introduced by Toru Kumon, a Mathematics teacher who particularly focused on his son's education. Exploring your mind (2017) explained that Kumon method aims to promote independent learning to enhance students' potential and academic competency based on their abilities. Furthermore, learning by this principle is a personalized and an individual process based on the proficiency of students.

Regardless of age and grade level, self-confidence and interest in student performance should be encouraged with the use of the four pillars of Kumon learning method. The four pillars of Kumon learning method that involves individual capacity, self-taught children, progressive development, and instructor.

Kumon Learning Theory emphasized that the best attainment of independent learning is by applying the four pillars of Kumon Learning Theory. First, Toru Kumon believed that individual capacity of student should be a great consideration and grade level, or age is not a limitation or objective in the Kumon Method. It is expected that every student should take advantage of every opportunity to learn and explore their competencies according to their ability. Second, the method values self-taught children wherein everyone is believed to possess the ability to solve exercises through their own personal effort by teaching themselves to arrive at solutions on their own. The next pillar is the progressive development of students' proficiency. In this pillar, the complexity of the exercises increases by organizing and preparing the material according to the learning progress. Lastly, the instructor as an observer. In the Kumon learning theory, the instructor plays an essential role as an observer of the academic ability and personality of each student. Instructors adapt the materials to the students' abilities and participate in the students' advancement by encouragement to take advantage of their abilities.

Toru Kumon hoped more children to become self-taught through the Kumon method. Kumon stated that studying will no longer involve suffering imposed by other people and will become a sort of pastime where the child progresses by themselves.

This study examines the independent learning of grade 12 learners in Mathematics 11 through the lens of Kumon Learning Theory which emphasizes four key variables such as individual capacity, self-taught children, progressive development, and the teacher. Individual capacity refers to the innate ability of each student to learn and develop their skills, which can vary widely between students. Self-taught children are those who are able to take ownership of their own learning process and take initiative in their studies. Progressive development refers to the gradual improvement and advancement in a student's learning over time. Finally, the teacher plays a critical role in facilitating and guiding the learning process, providing feedback, and supporting student progress. These four variables serve as the pillars of Kumon Learning Theory and are used to examine how grade 11 students in Mathematics approach independent learning in face-to-face, modular, and online learning contexts.

In addition to these four pillars, written works and performance tasks were also considered as important variables in crafting an effective action plan for independent learning. Written works served as tools for assessing and evaluating student progress. Performance tasks, on the other hand, were activities that allow students to demonstrate their understanding of the subject matter and apply it in real-world situations. By considering these two additional variables, the researcher may design action plan that integrate written works and performance tasks as essential components of independent learning. This action plan may include strategies for providing constructive feedback, opportunities for self-reflection and self-assessment, and scaffolded learning experiences that support student progression towards mastery of mathematical concepts. Overall, by utilizing both the four pillars of Kumon Learning Theory, written works and performance tasks, the researcher may create a comprehensive and effective approach to promote independent learning of Mathematics among grade 12 students.

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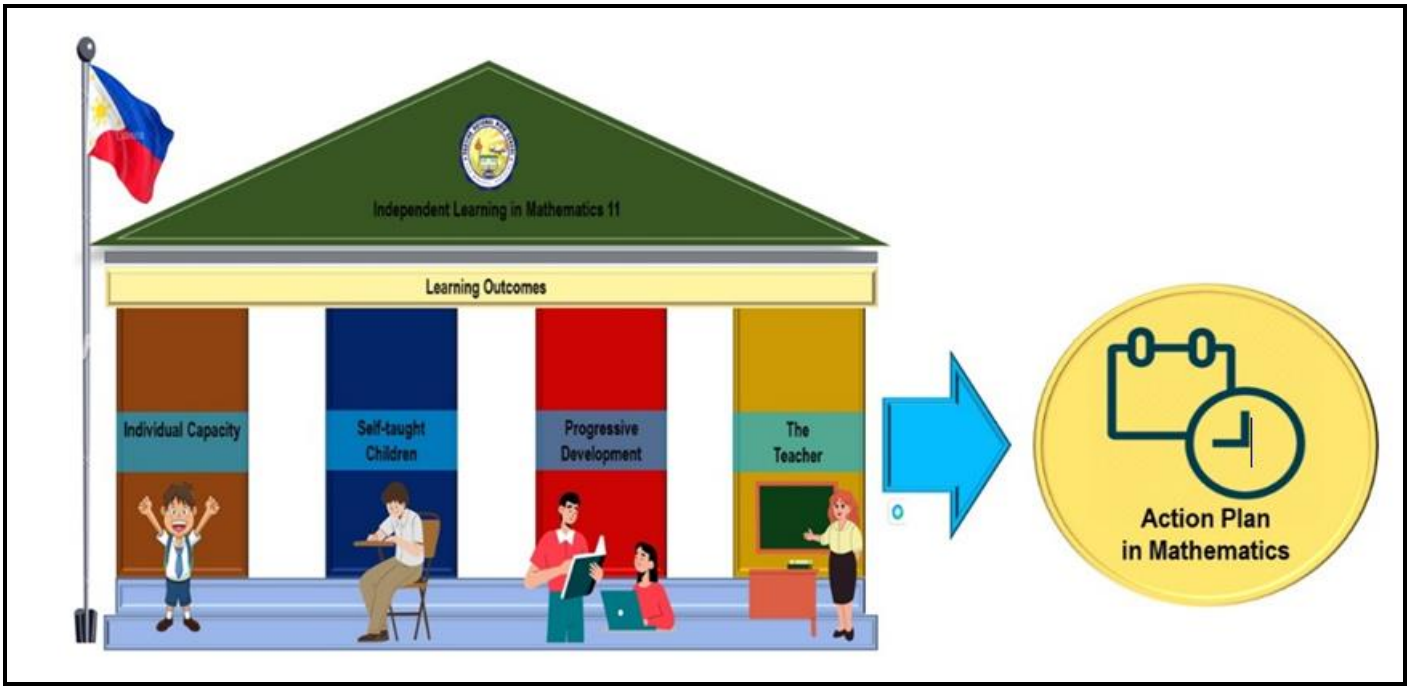

Fig 1: Theoretical and Conceptual Framework of the Study

B. Research Questions

This study aimed to describe the independent learning of Grade 12 learners in Mathematics 11 under the blended learning modality of Partida National High School. Specifically, this study sought answers to the following questions:

- *How May the Independent Learning Strategies of the Respondents in Mathematics be Described in Terms of the Following Pillars of Kumon in Terms of:*

- Individual Capacity;
- Self-Taught Children;
- Progressive Development; And
- The Teacher?

- *How May the Independent Learning Output of the Respondents be Described in Terms of:*

- Written works and
- Performance tasks?

- *Is there a Significant Relationship Between Independent Learning Strategies and Learning Outputs?*

II. METHODOLOGY

A. Research Design

In this study, descriptive-correlational method was utilized to answer the how's and what's questions stated and to determine significant relationship between independent learning and their learning outputs. According to Babbie (2016), descriptive-correlational research methods refer to a type of study that aims to describe the characteristics of a particular group or phenomenon and to determine whether there is a relationship between two or more variables. The purpose of this type of research is to identify patterns and relationships between variables without making causal claims or manipulating variables. Furthermore, descriptive-correlational methods are appropriate when a researcher wants to study a phenomenon in its natural environment, and it is not feasible or ethical to manipulate the variables. (Babbie, 2016).

B. Respondents of the Study

The study used a purposive sampling method, otherwise called selective sampling, a non-probability testing procedure. Specifically, total enumeration method was utilized to select all 90 grade 12 students who underwent face to face learning combined with either modular or online modality. The researcher opted for a purposive sampling technique to be used in the study because it was the most appropriate considering the specific requirements that the respondents needed to qualify before participating in the study. According to Campbell et al. (2020), the use of purposive sampling is one way to select respondents who are believed to provide appropriate and useful information. Furthermore, a purposive sample is a non-probability sample that is selected based on characteristics of a population and the objective of the study (Crossman, 2020).

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Table 1: Respondents of the Study

Section	Frequency	Percentage
Newton	29	32.22%
Einstein	31	34.44%
Darwin	30	33.33%
Total	**90**	**100.00%**

The given data presents three class sections of respondents named Newton, Einstein, and Darwin, based on their academic strand combinations. Newton consists of 29 respondents who have chosen subjects from both the General Academic Strand (GAS) and the Humanities and Social Sciences (HUMSS) strand. Einstein comprises 31 respondents who have opted for subjects from both the GAS and the Accountancy, Business, and Management (ABM) strand. Darwin includes 30 students who have a combination of the GAS and the Technical-Vocational and Livelihood (TVL)-Home Economic strand. This information allows for the analysis and comparison of students across different academic strand combinations.

C. Data Gathering Procedures

The data gathering procedure encompassed several essential steps to ensure accurate and reliable data collection. This procedure involved three main stages: the construction of the instrument, validation and reliability testing of the instrument, and administration of the instrument. The first stage involved the careful design and development of the data collection tool in a survey questionnaire tailored to the research objectives. Subsequently, the instrument underwent validation and reliability testing to assess its effectiveness in measuring the intended variables accurately. Finally, the instrument was administered to the target respondents, ensuring proper implementation and adherence to standardized protocols. These systematic procedures ensured the collection of high-quality and dependable data for subsequent analysis and interpretation.

- The research instrument that was used in this study is a researcher-made questionnaire constructed through reading related literature, studies, and the theory that was used. Moreover, in constructing the questionnaire used in the study, the researcher adopted the variables of Kumon Learning Theory, which are individual capacity, self-taught children, progressive development, and the teacher. The questions were designed to measure the extent to which these variables influence the strategies of grade 12 students in Mathematics 11 under blended learning. To construct the questionnaire, the researcher first identified the key concepts related to each variable and formulated questions that would assess these concepts. The questions were then organized into sections based on the variables they were measuring. The first part of the questionnaire consisted of questions pertaining to learning strategies of grade 12 students in Mathematics 11 which were answerable by a four-point Likert scales namely, always (4), oftentimes (3), sometimes (2) and never (1) while, the last part of the questionnaire was made to describe the learning outcomes wherein the questions were answerable with the same Likert scale.
- After the questionnaire was validated with corresponding content validity index of one, the researcher administered the pilot testing to 50 non-participating individuals who are also engaged in blended learning. The internal consistency of the questionnaire used in the study obtained the highest Cronbach Alpha coefficient of 0.9064 and 0.9269 which describes excellent internal consistency in written works and performance tasks. On the other hand, the reliability test obtained good and acceptable internal consistency in individual capacity, self-taught children, progressive development, and the teacher with coefficients of 0.7403, 0.7950, 0.7260 and 0.8672 respectively.
- Administering a questionnaire involved a systematic process to ensure the validity and reliability of the data collected. It began with orienting participants about the study's purpose, data handling, and confidentiality measures. Next, students completed an assent form to agree to participate, while informed consent from parents was obtained in advance, detailing the study and confidentiality protocols. Finally, the survey questionnaire was distributed to students, who were given ample time to complete it, with the researcher available for any questions. This structured approach ensured that the data collection was both ethically sound and methodologically rigorous.

D. Statistical Treatment of Data

To facilitate the accuracy and reliability of interpretation of data, the subsequent applied mathematics tools were used: weighted mean and Pearson Correlation Coefficient, r. Weighted Mean was used to describe the independent learning strategies and outputs of students through a four-point Likert scale to interpret the mean scores of the respondents. Pearson Correlation Coefficient, r was utilized to determine significant relationship between learning strategies and learning outputs of grade 12 students in Mathematics 11.

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Table 2: Four-Point Likert Scale

Mean Range	Verbal Description	Verbal Interpretation
3.25 - 4.00	Always	It indicates that students are always performing independent learning strategies under Blended Learning Modality
2.50 - 3.24	Oftentimes	It indicates that students are oftentimes performing independent learning strategies under Blended Learning Modality
1.75 - 2.49	Sometimes	It Indicates that students are sometimes performing independent learning strategies under Blended Learning Modality
1.00 - 1.74	Never	It Indicates that students never perform independent learning strategies under Blended Learning Modality

III. RESULTS

A. Learning Strategies of the Respondents under Blended Learning Modality

- *Individual Capacity*

Table 3: Learning Strategies in terms of Individual Capacity

As a Face to Face and Modular Distance Learning/Face to Face and Online Distance Learning student…	Weighted Mean	Verbal Description
1. I recall ideas in Mathematics such as facts, concepts, and theories. (Knowledge/Remembering)	2.62	Oftentimes
2. I understand and make intellectual use of knowledge in Mathematics. (Comprehension/ Understanding)	2.72	Oftentimes
3. I map concepts onto actual objects, events or phenomena encountered in the real world. (Application/Applying)	2.77	Oftentimes
4. I break ideas into their parts and logical premises. (Analysis/Analyzing)	2.62	Oftentimes
5. I develop ideas from apparently unrelated parts. (Synthesis/Synthesizing)	2.67	Oftentimes
6. I judge the merit of ideas for given purposes. (Evaluation/Evaluating)	2.66	Oftentimes
7. I combine known patterns, ideas, and facts to create original work or formulate solution to a problem. (Creating)	2.97	Oftentimes
Average	**2.72**	**Oftentimes**

Table 3 presents the independent learning strategies of the respondents in Mathematics in terms of individual capacity. Results show that the highest weighted mean, 2.97 is for Item 7, which is "combine known patterns, ideas, and facts to create original work or formulate solution to a problem" under the category of "Creating". On the other hand, the lowest weighted means are for Items 1 and 4, which are "recall ideas in Mathematics such as facts, concepts, and theories" and "break ideas into their parts and logical premises" respectively. Both items belong to the category of "Knowledge/Remembering" and "Analysis/Analyzing", with a weighted mean of 2.62. The general weighted mean for all items is 2.72, which also indicates that the respondents often engage in the different types of thinking included in the survey.

The result indicates that respondents often employ independent learning strategies in Mathematics based on their individual capacity specifically, indicating that respondents often create original work or formulate solutions to problems but find it more challenging to recall ideas break into parts and logical premises in Mathematics.

Furthermore, Cardino Jr. and Ortega-Dela Cruz (2020) analyzed the influence of learning styles and teaching strategies on mathematics performance. The surveys were conducted with 277 randomly selected Grade 9 and five deliberately selected mathematics teachers. The results indicated that the majority of the students surveyed had a combination of dependent, collaborative, and independent learning styles. Multiple regression analysis shows that among the learning styles, only the independent style has a significant impact on Grade 9 academic performance.

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➢ *Self-Taught Children*

Table 4: Learning Strategies in Terms of Self-Taught Children

As a Face to Face and Modular Distance Learning/Face to Face and Online Distance Learning student…	Weighted Mean	Verbal Description
1. I identify my learning goals and needs in Mathematics.	3.08	Oftentimes
2. I question the significance of learning Mathematics lessons.	2.91	Oftentimes
3. I find challenge related to a problem I care to solve.	2.97	Oftentimes
4. I check my learning processes in Mathematics.	3.04	Oftentimes
5. I understand my learning approaches in Mathematics.	2.80	Oftentimes
6. I get to know the topic I am learning by knowing some background information about it.	3.07	Oftentimes
7. I cultivate intrinsic motivation by sharing what I have learned about the topic.	2.74	Oftentimes
8. I make something out of what I have learned to have the mastery of what I have learned.	2.61	Oftentimes
9. I leverage my time whenever I get busy and do not have time to study Mathematics lessons.	2.69	Oftentimes
10. I make a topic list in creating and working to achieve my goals.	2.92	Oftentimes
11. I value my learning progress over performance.	3.03	Oftentimes
12. I start small and work my way up to have my goals set within my own limits.	3.15	Oftentimes
13. I collaborate and connect with groups of people to build a network of learning team.	3.00	Oftentimes
Average	**2.92**	**Oftentimes**

Table 4 presents the weighted mean and verbal interpretation of the independent learning strategies of self-taught children in Mathematics. Among the indicators, item 12, “start small and work my way up to have my goals set within my own limits" has the highest weighted mean of 3.15, followed by item 1, "identify my learning goals and needs in Mathematics" with a weighted mean of 3.08. On the other hand, item 8, "make something out of what I have learned to have the mastery of what I have learned" has the lowest weighted mean of 2.61. The overall weighted mean is 2.92 which indicates that self-taught children often employ independent learning strategies in Mathematics.

The results imply that self-taught children in Mathematics prioritize setting realistic goals and understanding their learning needs, as well as checking their learning processes and starting small to achieve their goals within their own limits. The lowest mean in the result suggests that self-taught children may struggle with applying what they have learned to real-world scenarios.

In a report published in 2018, the Midwest Comprehensive Center at American Institutes for Research highlighted the significance of goal setting as a fundamental competency area for students. The report specifically emphasized its role in the development of crucial "learning-to-learn" skills that are essential for engaging in deeper learning experiences.

➢ *Progressive Development*

Table 5: Learning Strategies in Terms of Progressive Development

As a Face to Face and Modular Distance Learning/Face to Face and Online Distance Learning student	Weighted Mean	Verbal Description
1. I begin by understanding the fundamentals when learning complex mathematics concepts.	2.74	Oftentimes
2. I use real-world examples as one of the best ways to make complex mathematics concepts easier to understand.	2.82	Oftentimes
3. I use visual aids as an effective way to help understand complex mathematics concepts.	3.01	Oftentimes
4. I break down each concept into small chunks to make complex and overwhelming mathematics concepts easier to understand.	2.76	Oftentimes
5. I start by doing lots of practice problems related to the concept I am trying to understand.	2.90	Oftentimes
6. I begin to understand the power of mistakes which will give me confidence to learn complex mathematics concepts.	2.84	Oftentimes
7. I persevere in learning complex mathematics concepts by breaking problems into smaller pieces.	2.81	Oftentimes
8. I focus on what the concepts are and their importance when learning complex mathematics concepts.	2.93	Oftentimes
9. I explore links between concepts to help bring clarity to difficult topics.	2.94	Oftentimes
Average	**2.86**	**Oftentimes**

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Table 5 shows the weighted mean and verbal interpretation of the independent learning strategies of learners in Mathematics in terms of progressive development. Among the indicators, item 3, "use visual aids as an effective way to help understand complex mathematics concepts" has the highest weighted mean of 3.01, followed by item 9, "explore links between concepts to bring clarity to difficult topics" with a weighted mean of 2.94. On the other hand, item 1, "begin by understanding the fundamentals when learning complex Mathematics concepts" has the lowest weighted mean of 2.74. The general weighted mean is 2.86, which indicates that learners often employ independent learning strategies in Mathematics when dealing with complex concepts.

The results suggest that learners in Mathematics find it helpful to use visual aids and explore links between concepts to gain a better understanding of complex concepts. Learners also recognize the importance of breaking down problems into smaller pieces and persevering in learning.

In a study, Knight (2021) conducted research that revealed the effectiveness of employing visual models in Mathematics to facilitate problem-solving and enhance students' understanding of relationships. The study indicated that utilizing visual models can assist students in surpassing their reliance on concrete, pictorial, and abstract representations, enabling them to delve deeper into mathematical concepts and their connections.

➢ *The Teacher*

Table 6: Learning Strategies in Terms of the Teacher

As a Face to Face and Modular Distance Learning/Face to Face and Online Distance Learning student	Weighted Mean	Verbal Description
1. I ask my teacher for guidance in figuring out how to make any opportunity productive as well as assistance for using online learning technologies collaboratively	3.18	Oftentimes
2. I create a positive environment for learning to achieve desired learning outcomes by communicating with my teacher.	3.11	Oftentimes
3. I use my teacher's positive and constructive feedback to provide relevant solutions to my learning problems	3.14	Oftentimes
4. I participate actively during discussions and build healthy relationships with my teacher.	3.14	Oftentimes
5. I maximize progress by accomplishing my teacher's managed learning plan and activities.	3.01	Oftentimes
6. I work in team activities as delegated by my teacher to improve my communication and collaboration skills among my classmates.	2.97	Oftentimes
7. I mentally and academically nourish practice leading to a rapid and effective learning experience because of my teacher's encouragement to learn in collaboration with my classmates.	3.02	Oftentimes
Average	**3.08**	**Oftentimes**

Table 6 provides information on the independent learning strategies of learners in Mathematics in terms of the teachers. The highest weighted mean score in item 1 of 3.18 is obtained for "ask my teacher's guidance in figuring out how to make any opportunity productive as well as assistance for using online learning technologies collaboratively". On the other hand, the lowest weighted mean is for Item 6, which is "work in team activities as delegated by my teacher to improve my communication and collaboration skill among my classmates" with a weighted mean of 2.97. Overall, the general weighted mean score of 3.08 indicates that learners often adopt independent learning strategies in Mathematics in collaboration with the teacher.

The results suggest that learners perceive their teacher as a valuable resource for learning and often seek their guidance and support in utilizing various tools and resources effectively. They also actively participate in discussions and use the teacher's feedback to solve learning problems. Additionally, learners value following a structured learning plan and completing the assigned activities to achieve their desired learning outcomes. Furthermore, learners work collaboratively with their classmates on team activities delegated by the teacher to improve their communication and collaboration skills. Overall, the findings suggest a positive attitude towards independent learning and a willingness to work collaboratively with the teacher to achieve desired learning outcomes.

Similarly, the National Center for Learning Disabilities (2021) proposed that fostering collaboration among teachers, students, families, and caregivers can play a vital role in bolstering student success. This collaborative approach encompasses working together to support and empower students through shared responsibilities, open communication, and coordinated efforts. By embracing this cooperative model, educators can effectively address the diverse needs of students, establish a supportive learning environment, and optimize the overall educational experience. Furthermore, involving families and caregivers in this collaborative process enhances the continuity of support and reinforces the connection between home and school, thereby contributing to students' academic achievements and well-being.

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➢ *Summary of Learning Strategies*

Table 7: Summary of Learning Strategies Under Blended Learning Modality

Learning Strategies	Weighted Mean	Verbal Description
1. Individual Capacity	2.72	Oftentimes
2. Self-taught Children	2.92	Oftentimes
3. Progressive Development	2.86	Oftentimes
4. The Teacher	3.08	Oftentimes
Average	**2.90**	**Oftentimes**

Table 7 shows that the lowest weighted mean is 2.72, which corresponds to the learning strategy of "Individual Capacity." The highest weighted mean is 3.08, representing the learning strategy of "The Teacher." The general weighted mean is 2.90 with verbal description "Oftentimes" which indicates that these learning strategies are frequently observed or implemented.

The results indicate that, on average, respondents tend to rely more on the learning strategy of "The Teacher" (weighted mean of 3.08) compared to the other strategies. This suggests that students often depend on the guidance, instruction, and support provided by their teachers in their learning process. However, the lowest weighted mean of 2.72 for "Individual Capacity" suggests that students may not consistently exhibit a strong inclination towards independent learning and self-directed strategies.

A similar result was found in a study conducted by Li et. al. (2021) where they explored the relationship between student-centered learning and academic achievement. Their findings revealed a positive association between independent learning approaches and academic performance. Independent learning emphasizes the active involvement of students in their learning process, promoting self-regulation and individual capacity. This supports the notion that developing students' independent learning skills can positively impact their academic performance.

B. Learning Outputs of the Respondents under Blended Learning Modality

➢ *Written Works*

Table 8: Learning Output In Terms of Written Works

As a Face to Face and Modular Distance Learning/Face to Face and Online Distance Learning student…	Weighted Mean	Verbal Description
1. I find written works simple and learning topics in Mathematics achievable.	3.04	Oftentimes
2. I stimulate my desire and interest to learn more about the subject matter by answering written work activities.	3.00	Oftentimes
3. I improve my study habits in Mathematics by answering written activities.	3.06	Oftentimes
4. I learn the concepts in Mathematics better when I answer the exercises in written activities.	2.94	Oftentimes
5. I review the topics in Mathematics through a compilation of written activities in every learning competency.	2.91	Oftentimes
6. I am given an advanced glimpse of what to expect for the whole quarter with the use of written activities.	2.87	Oftentimes
7. I am well-guided with the subject requirements and competencies with the use of written activities.	2.87	Oftentimes
8. I summarize daily lessons by answering written activities.	2.84	Oftentimes
9. I improve my mastery level in Mathematics lessons with the use of written activities.	2.91	Oftentimes
10. I am able to learn the competency for everyday lessons with the use of written activities.	2.97	Oftentimes
Average	**2.94**	**Oftentimes**

Table 8 provides information on the independent learning output of respondents in Mathematics in terms of written works. The highest weighted mean is for Item 3, which is "improve my study habits in Mathematics by answering written activities" with weighted mean of 3.06, indicating that the learners often use written activities to improve their study habits in Mathematics. On the other hand, the lowest weighted mean is for Item 5, which is "review the topics in Mathematics through a compilation of written activities in every competency" with weighted mean of 2.91, indicating that the learners engage in this type of activity less often compared to other items. The general weighted mean for all items is 2.94, indicating that learners often engage in using written activities to learn Mathematics, but not to a very high extent.

Overall, the result indicates that respondents often perceive written works as an effective tool for enhancing their learning outcomes in Mathematics. The high scores in most indicators suggest that written works are well-received by respondents, and are considered effective in improving their study habits, stimulating their interest in the subject matter, and helping them learn and review concepts in Mathematics.

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➢ *Performance Tasks*

Table 9: Learning Output In Terms of Performance Tasks

As a Face to Face and Modular Distance Learning/ Face to Face and Online Distance Learning student…	**Weighted Mean**	**Verbal Description**
1. I find performance tasks simple and learning topics in Mathematics achievable.	2.93	Oftentimes
2. I stimulate my desire and interest to learn more about the subject matter by accomplishing performance tasks.	2.99	Oftentimes
3. I improve my study habits in Mathematics by accomplishing performance tasks.	2.84	Oftentimes
4. I learn concepts in Mathematics better when I accomplish performance tasks.	2.89	Oftentimes
5. I review the topics in Mathematics through a compilation of performance tasks in all competencies.	2.80	Oftentimes
6. I am given an advanced glimpse of what to expect in the summative assessments with the use of performance tasks.	2.81	Oftentimes
7. I am well-guided in the subject requirements and competencies with the use of performance tasks.	3.07	Oftentimes
8. I summarize each quarter lesson by accomplishing performance tasks.	2.81	Oftentimes
9. I improve mastery level in Mathematics lessons with the use of performance tasks.	2.80	Oftentimes
10. I can learn the competencies for every quarter lesson with the use of performance tasks.	2.92	Oftentimes
Average	**2.89**	**Oftentimes**

Table 9 shows the learning output of the respondents in terms of performance tasks. The highest weighted mean in the survey is for item 7, "am well-guided of the subject requirements and competencies with the use of performance tasks" with a weighted mean of 3.07. The lowest weighted mean is for item 5, "review the topics in Mathematics through a compilation of performance tasks in all competencies" with a weighted mean of 2.80. The general weighted mean is 2.89, indicating that overall, learners find performance tasks in Mathematics to be helpful in achieving desired learning outcomes.

The overall weighted mean indicates that respondents often find performance tasks as an effective tool in their learning. The result indicates that learners often feel well-guided by performance tasks in terms of subject requirements and competencies but suggests that most learners do not review topics in Mathematics often through a compilation of performance tasks in all competencies.

C. Relationship Between Independent Learning Strategies and Learning Outputs Written Works

Table 10: Test of Relationship Between Independent Learning Strategies and Outputs

Strategies	**Written Works**		**Performance Tasks**	
	r	***p***	***r***	***p***
Individual Capacity	.572**	.001	.664**	.001
Self-Taught Children	.731**	.001	.754**	.001
Progressive Development	.692**	.001	.701**	.001
The Teacher	.787**	.001	.751**	.001

Legend:
****** Correlation, r is significant at the 0.01 level (two-tailed)
***** Correlation, r is significant at the 0.05 level (two-tailed)

Table 10 presents the correlational analysis to determine the relationship of independent learning strategies and learning outputs. The researcher used Pearson's r correlation with 5% level of significance to test the hypothesis. The results indicate individual capacity (r = .572, p <.001), self-taught children (r = .731, p <.001), progressive development (r = .692, p <.001) and the teacher (r = .787, p <.001) had significant association to written works. The strength of correlations ranged from moderate to strong correlation.

This indicates that there is a meaningful relationship between these independent learning strategies and the quality or quantity of written works produced. Similarly in a study conducted by Hobden and Hobden (2019) in South African primary schools, it was discovered that the amount and quality of written work, as well as the feedback provided by teachers in learner books, serve as crucial and visible indicators of the learning opportunities available to students.

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Moreover, the analysis also indicates that individual capacity (r = .664, p <.001), self-taught children (r = .754, p <.001), progressive development (r = .701, p <.001) and the teacher (r = .751, p <.001) had significant association to written works. The strength of correlations ranged from moderate to strong correlation. The p-values reported for each correlation ($p < 0.001$) indicate that the associations found are highly unlikely to have occurred by chance. Thus, there is strong evidence to support the assertion that these independent learning strategies have a significant impact on learning outputs, specifically in relation to written works.

According to the findings of Biwer et al. (2020), cognitive psychological research has demonstrated that learning strategies which incorporate desirable difficulties, such as practice testing, are the most effective in achieving long-term learning outcomes.

IV. DISCUSSION

A. Learning Strategies of Grade 12 Students Under the Blended Learning Modality

Result shows that the lowest weighted mean was 2.72, which corresponds to the learning strategy of "Individual Capacity." The highest weighted mean was 3.08, representing the learning strategy of "The Teacher." The general weighted mean was 2.90 with verbal description "Oftentimes" which indicates that these learning strategies were frequently observed or implemented.

- *Individual Capacity*

The results showed that the highest weighted mean, 2.97 was obtained by item 7, "combine known patterns, ideas, and facts to create original work or formulate solution to a problem" under the category of "Creating". On the other hand, the lowest weighted means were obtained by items 1 and 4 respectively, which were "recall ideas in Mathematics such as facts, concepts, and theories" and "break ideas into their parts and logical premises" respectively. Both items belong to the category of "Knowledge/Remembering" and "Analysis/Analyzing", with a weighted mean of 2.62. The general weighted mean for all items was 2.72, which also indicates that the learners often engaged in the several types of thinking included in the survey.

- *Self-Taught Children*

The overall weighted mean of learning strategies in terms of self-taught children was 2.92 which indicates that self-taught children often employ independent learning strategies in Mathematics. Among the indicators, item 12, “start small and work my way up to have my goals set within my own limits" had the highest weighted mean of 3.15, followed by item 1, "identify my learning goals and needs in Mathematics" with a weighted mean of 3.08. On the other hand, item 8, "make something out of what I have learned to have the mastery of what I have learned" had the lowest weighted mean of 2.61.

- *Progressive Development*

The general weighted mean of learning strategies in terms of progressive development was 2.86, which indicates that learners often employ independent learning strategies in Mathematics when dealing with complex concepts. Among the indicators, item 3, "use visual aids as an effective way to help understand complex mathematics concepts" had the highest weighted mean of 3.01, followed by item 9, "explore links between concepts to help bring clarity to difficult topics" with a weighted mean of 2.94. On the other hand, item 1, "begin by understanding the fundamentals when learning complex mathematics concepts" had the lowest weighted mean of 2.74.

- *The Teacher*

The highest weighted mean of learning strategies in terms of the teacher was obtained by item 1 with 3.18, “ask my teacher’s guidance in figuring out how to make any opportunity productive as well as assistance for using online learning technologies collaboratively”. On the other hand, the lowest weighted mean was for item 6, "work in team activities as delegated by my teacher to improve my communication and collaboration skill among my classmates" with a weighted mean of 2.97. Overall, the general weighted mean score of 3.08 which indicates that learners often adopted independent learning strategies in Mathematics in collaboration with the teacher.

B. Learning Outputs of the Respondents under Blended Learning Modality

The results showed that the weighted mean for "Written Works" was 2.94. The weighted mean for "Performance Tasks" was slightly lower at 2.89. The general weighted mean, which averages the weighted means of both outputs, was 2.92, indicating that overall, students frequently demonstrated competency in their learning outputs.

- *Written Works*

The highest weighted mean for learning outputs in terms of written works was obtained by item 3, "improve my study habits in Mathematics by answering written activities" with weighted mean of 3.06, indicating that the learners often use written activities to improve their study habits in Mathematics. On the other hand, the lowest weighted mean was for Item 5, which is "review the topics in Mathematics through a compilation of written activities in every competency" with weighted mean of 2.91, indicating that the learners engage in this type of activity less often compared to other items. The general weighted mean for all items was 2.94, indicating that the learners often engaged in using written activities to learn Mathematics, but not to an extremely high extent.

- *Performance Tasks*

The highest weighted mean for learning outputs in terms of performance tasks was obtained by item 7, "am well-guided of the subject requirements and competencies with the use of performance tasks" with a weighted mean of 3.07. The lowest weighted mean was obtained by item 5, "review the topics in Mathematics through a compilation of performance tasks in all competencies" with a weighted

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mean of 2.80. The general weighted mean was 2.89, indicating that overall, the learners often found performance tasks in Mathematics helpful in achieving desired learning outcomes.

C. Relationship Between Independent Learning Strategies and Learning Outputs

For written works, the correlation coefficients indicated positive relationships with independent learning strategies. All these correlations were statistically significant at the 0.05 level (2-tailed), as indicated by the p-values of 0.001. Similarly, for performance tasks, positive relationships were observed between independent learning strategies and the learning output. All these correlations were statistically significant at the 0.05 level (2-tailed) with p-values of 0.001. The significant p-values confirm that these correlations were highly unlikely to have occurred by chance alone.

V. CONCLUSIONS

➢ *Based on the Findings, the Researcher Drew the Following Conclusions:*

- The highest weighted mean among various learning strategies was for "The Teacher," indicating that students rely on guidance from their teachers, while "Individual Capacity" received the lowest weighted mean, suggesting that students exhibited less reliance on independent learning strategies; the overall weighted mean reflects that students tend to employ learning strategies "oftentimes".
- The weighted mean of "Written Works" was slightly higher than that of "Performance Tasks," and the overall weighted mean suggests that students generally demonstrate competence in their learning outputs
- There were significant positive correlations between independent learning strategies and both written works and performance tasks, with correlation coefficients indicating a reliable association between these strategies (including individual capacity, self-taught children, progressive development, and the teacher) and academic performance in these learning outputs.

RECOMMENDATIONS

➢ *Based on the Conclusions, the Researcher Formulated the Following Recommendations:*

- To improve learning strategies, teachers may focus on recalling ideas in Mathematics such as facts, concepts, and theories and breaking down ideas into their parts and logical premises for learning strategies in terms of individual capacity; to encourage learners to create something out of what they have learned to achieve mastery for learning strategies in terms of self-taught children; to start with understanding the fundamentals when learning complex Mathematics concepts for learning strategies in terms of progressive development; and to provide more team activities to enhance communication and collaboration skills among classmates for Learning Strategies in Terms of the Teacher.
- For Written Works, learners may review the topics in Mathematics through a compilation of written activities in every competency to increase engagement; for Performance Tasks, learners may review the topics in Mathematics through a compilation of performance tasks in all competencies to improve learning outcomes.
- Further research may be conducted to explore the factors that may influence the independent learning strategies of learners, as it appears that their profile, including their SHS strand and modality, did not significantly impact their use of independent learning strategies. Additionally, it may be beneficial to investigate other factors that may contribute to their grades, as the correlation coefficients between independent learning strategies and grades were low.
- School administrators may tailor educational programs and resources to meet the learners' needs and preferences considering that blended learning approach that combines modular and face-to-face learning was the preferred learning modality. Furthermore, the study emphasizes the importance of providing high-quality mathematics education to students.
- 5.Curriculum and program developers may also provide education programs and resources to meet the learners' needs and preferences, with a blended learning approach being the most preferred learning modality. They may also develop effective teaching strategies to enhance students' independent learning skills, as students frequently use independent learning strategies in Mathematics.

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